UK Inertial Fusion Science & AWE Links

October 2009

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Background

The UK IFE Community is very small

Resources in Academia and Defence are limited

The achievement of ignition is possible in the next couple of years (NIF)

Other facilities are becoming available (eg ORION)

- AWE commenced an experimental study of ICF capsule implosions, underground, 30 years ago. It was successful and validated codes in a relevant regime.

- Two relevant reviews are imminent – the UK Fusion Energy Strategy & the STFC Investment strategy

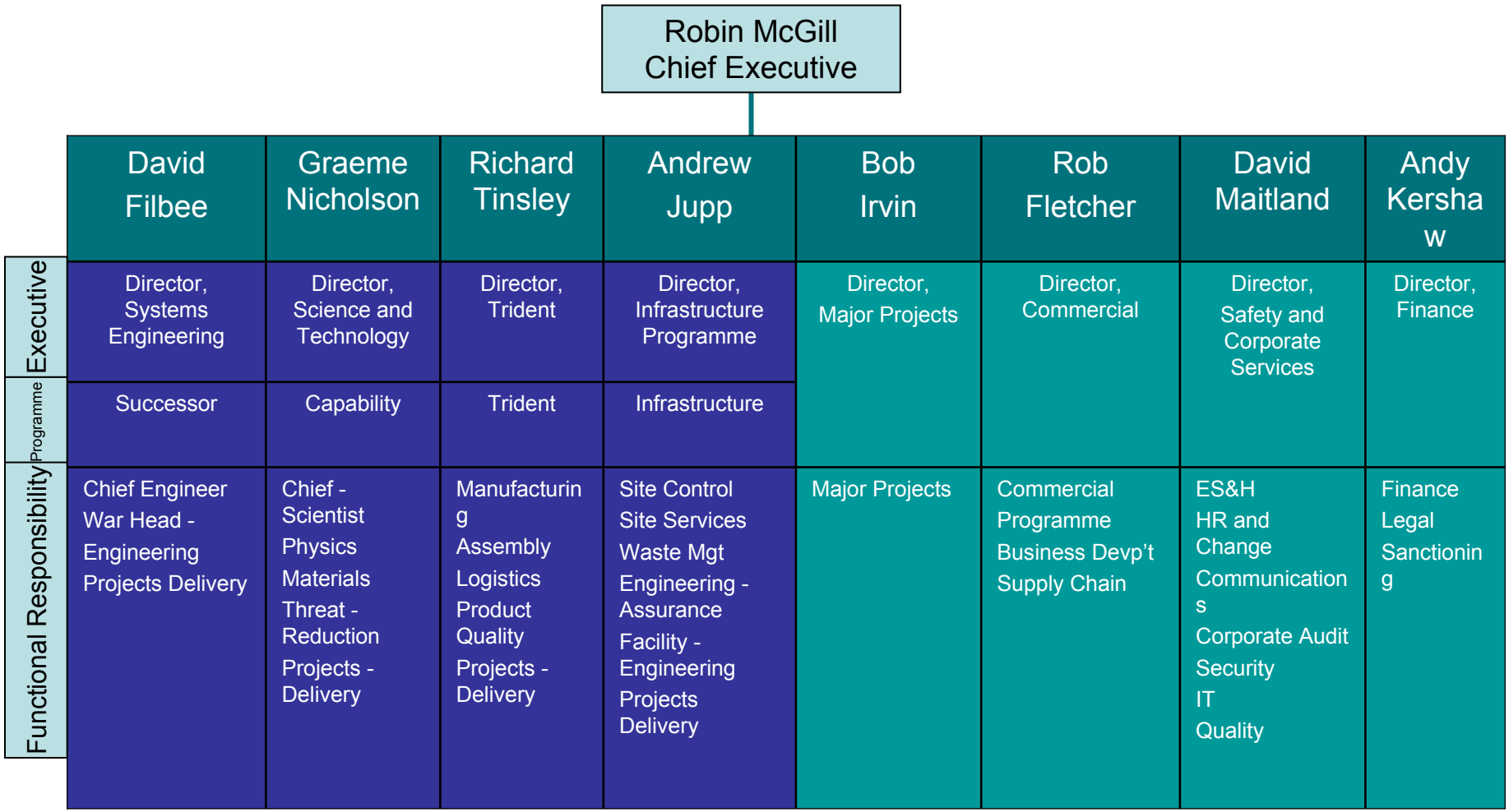
The interaction between the defence and academic communities is not as strong as in the US and France

It makes sense to explore the potential for increased interaction within the UK

Meeting Objectives

- Provide a technical overview of relevant activities
- Consider the implication of current reviews
- Explore the potential for increased interaction within the UK
- Discuss next steps, including European interaction (HiPER) and US (NIF) and the role that the Centre for Inertial Fusion Science (CIFS) can play

AWE Operating Division



Peter Roberts

Head of Plasma Physics

Distinguished Specialists

Peter Thompson
John Foster
Brian Thomas

Facility Safety

Graham White
Steve Melton

Tom Bett

Laser Operations
Target Fabrication
ORION sponsor

Tim Goldsack

Plasma Experiments
Diagnostics &
Modelling

Adrian Gannon

Radiation Science
capability
VIPER & ASP

Paul Morris

Engineering Manager
& ORION Installed
Equipment

Areas of study

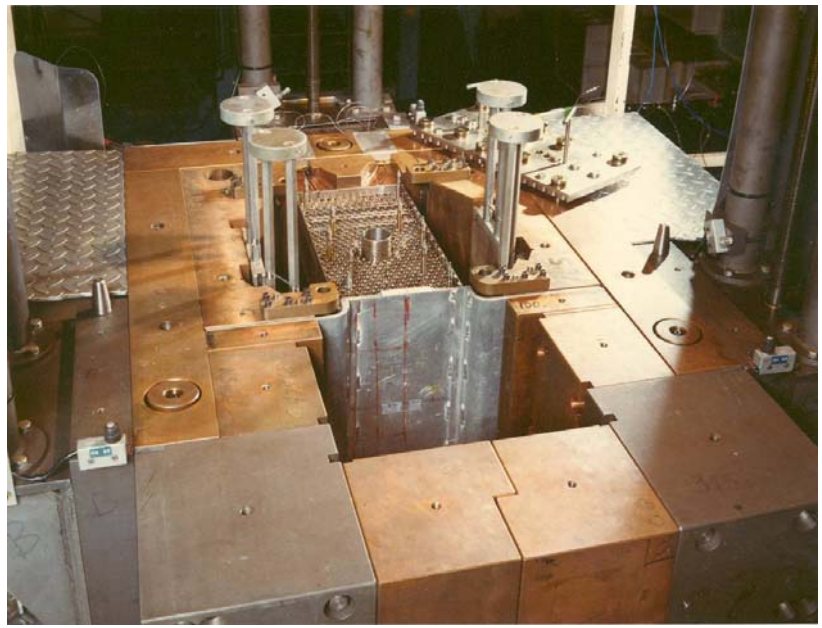
HEDP:

- Radiation transport
- Radiation hydrodynamics
- Material properties – opacity, EoS, strength, spall
- Nuclear physics including fusion/burn
- Plasma dynamics including instabilities
- Integrated effects

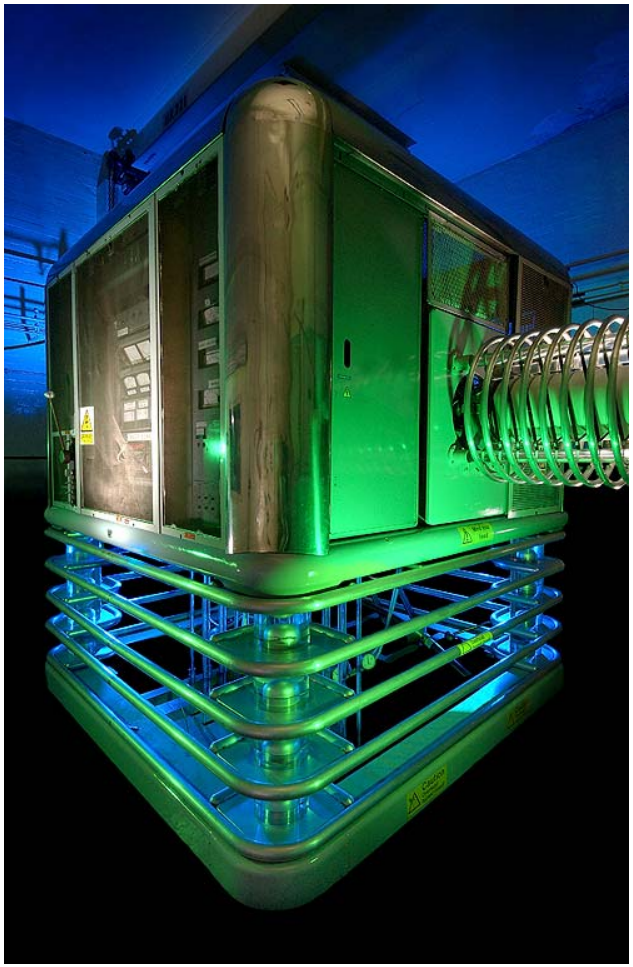
Radiation Science:

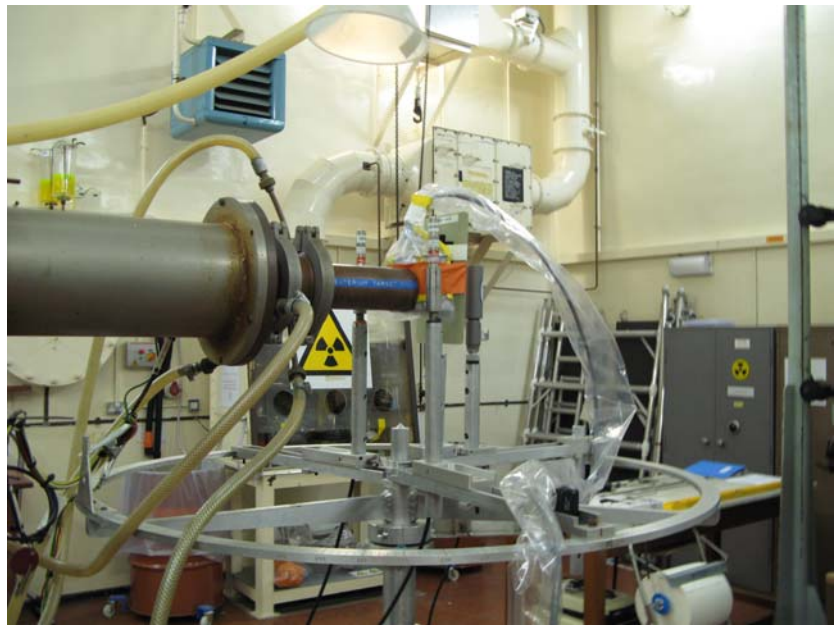
- X-ray, Γ-ray and neutron transport and interaction
- Material and system response including neutron effects, thermo-mechanical and electrical / electromagnetic.

VIPER



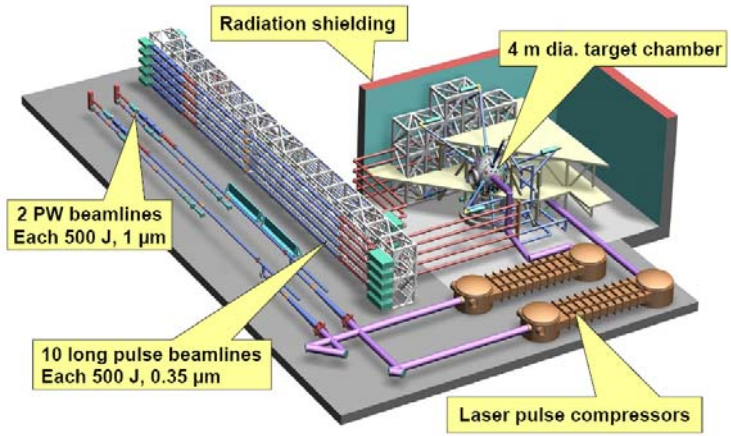
ASP

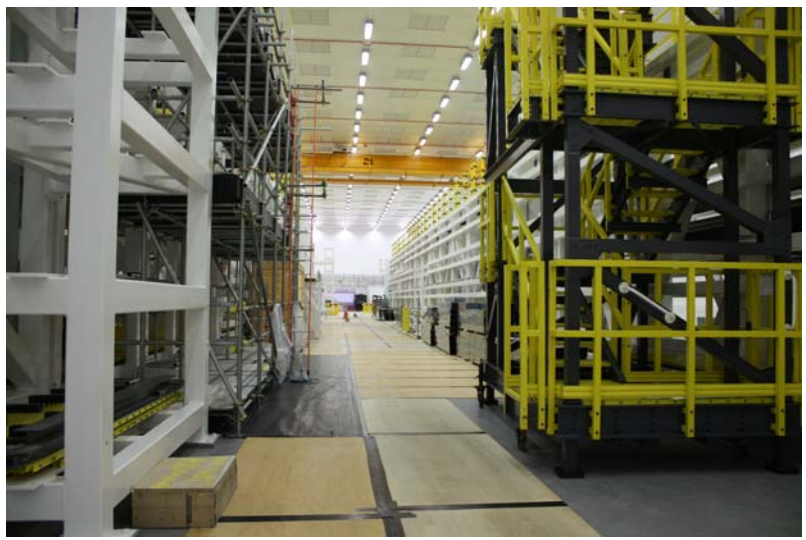




ORION

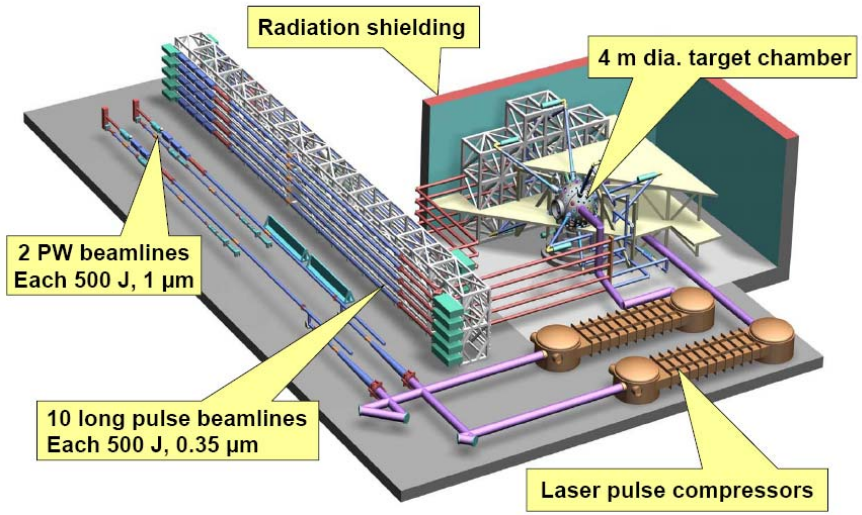
ORION


Radiation shielding
4 m dia. target chamber
2 PW beamlines
Each 500 J, 1 μm
10 long pulse beamlines
Each 500 J, 0.35 μm
Laser pulse compressors



ORION

ORION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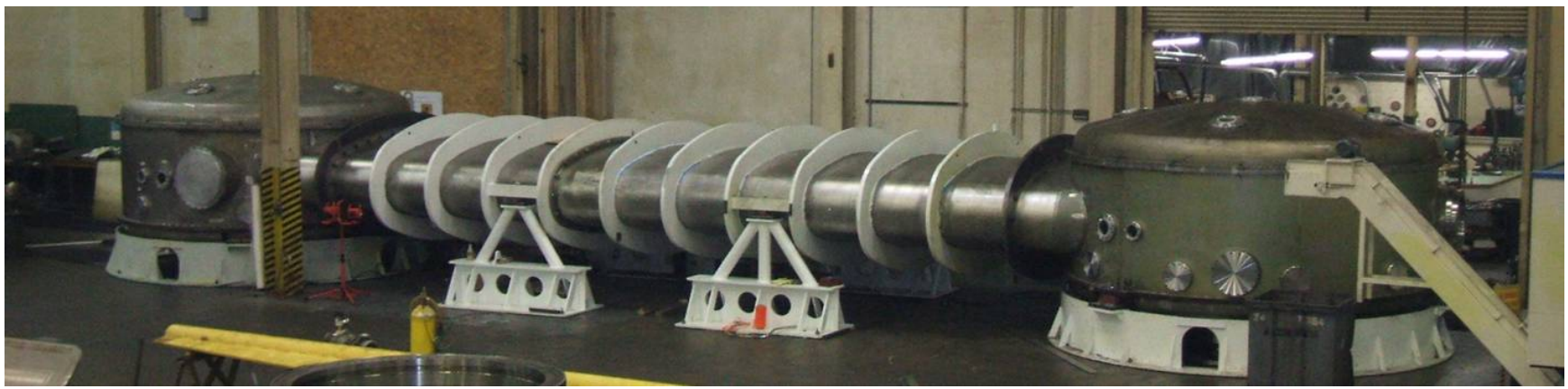
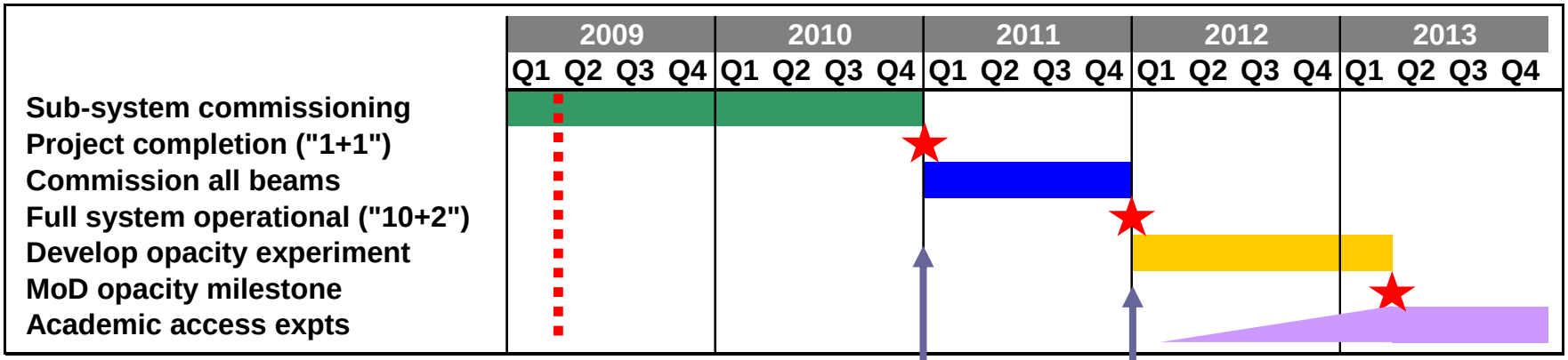


Limited “compatible” academic access may be possible during 2012. More extensive access becomes available thereafter.



Orion academic access timescales

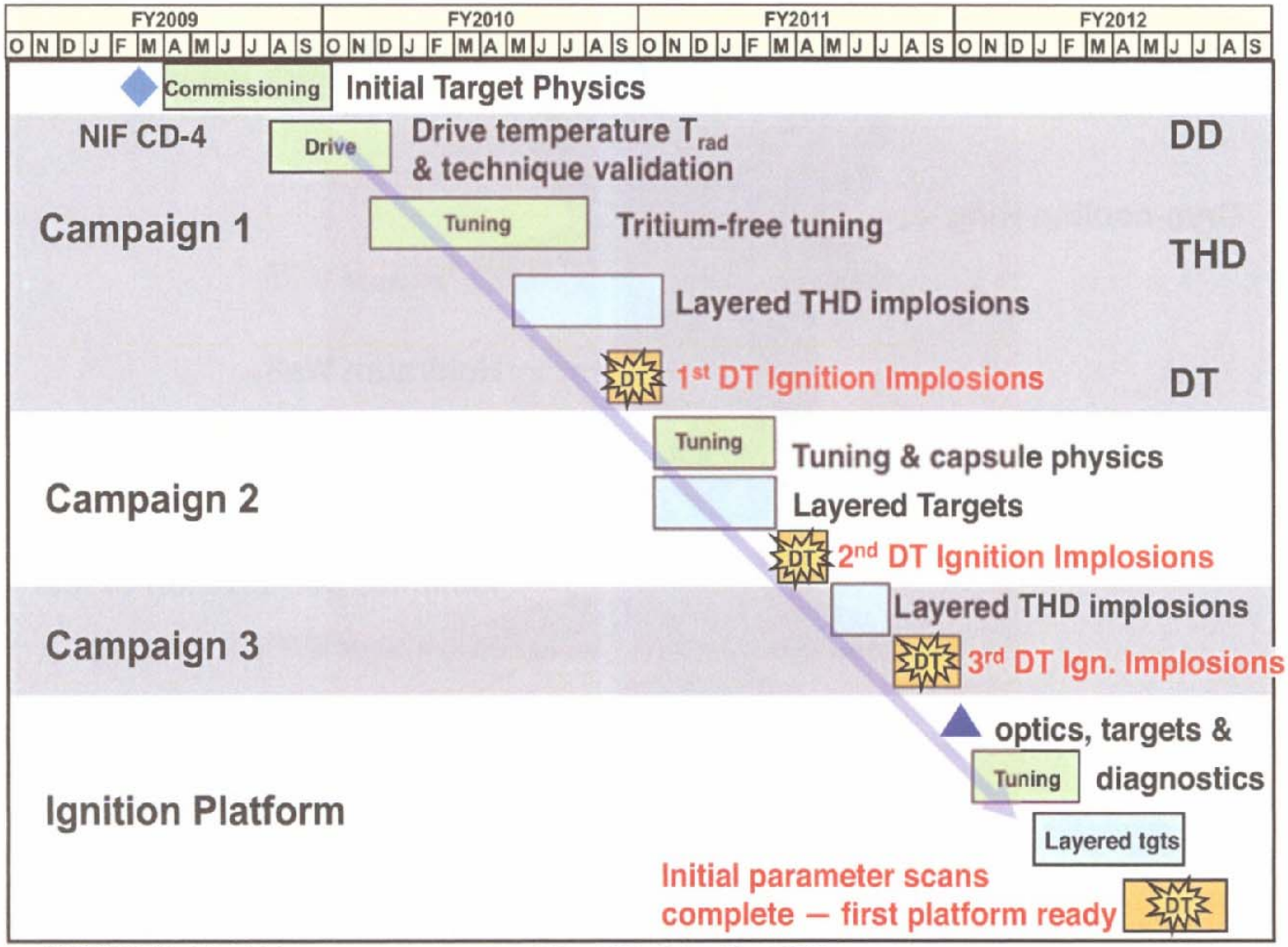
- One short-pulse, one long-pulse beam available
- All beams available
- Opportunity for compatible, “low facility impact” collaborative access to ORION.
- More extensive access to ORION becomes available

National Ignition Facility
LLNL

NIF – Dedicated May 2009

NIC EP Rev 3.1— Includes three ignition campaigns and deployment of an initial ignition platform

NIC
The National Ignition Campaign



Centre for Inertial Fusion Science

Objectives:

- Provide a means for interacting with the academic community, including HiPER
- Provide a forum for discussing HEDP experiments on ORION
- Established at Imperial College, Oct 1st 2009
- Intended to be inclusive

AWE presentations

- Capsule / Hohlraum Code Development
  and preliminary calculations of a HiPER design
- Implosion modelling, uses of ignition
- Recent OMEGA implosion data
- Recent HELEN data
- Fast Electron modelling

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